Using the MSS from OpenVMS

NIS Division's Mass Storage System (MSS) is a UNIX based system, yet much of the Division's space based data are stored using VAX/VMS formats and require OpenVMS for processing. In addition to the differences between command syntax in OpenVMS and UNIX, there also exist incompatabilities between file formats. This presentation covers techniques and requirements for effectively utilizing the MSS from an OpenVMS system. In particular, all data on the RV20 optical platters is actively being moved to the MSS. The techniques covered in this presentation will enable OpenVMS users to access that data.

MSS Library

OpenVMS (nisdp0)

on-line presentation: http://nis-www.lanl.gov/mss

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What is MSS

MSS is a system for storing massive amounts of data on-line or near-line. It is composed of hardware & software.

- **UNIX Based System composed of hardware and software (sstcx1.lanl.gov)**
- **12 Terabyte Robotic Library (600 tapes)**
- **5 Tape Drives**
- **25 Gigabytes of Disk Cache**
- **EMASS FileServ Software**

The MSS looks like a local disk on sstcx1.

- **Actual data may be on the disk cache - access is fast**
- **The data may be only on tape - the file must be moved on to the disk cache - access is slower**

Accessing the MSS from the Network

The MSS may be accessed by UNIX workstations or Open VMS via the network

- **ftp**
  - **(pro) faster than NFS**
  - **(con) must have extra disk space to store the file**
  - **(con) must retrieve entire file**
  - **(con) not transparent**

- **NFS**
  - **(con) slower than ftp**
  - **(pro) doesn't require any extra disk space to work with a file**
  - **(pro) may only need to work with part of a file**
  - **(pro) transparent**

Bottom line: if you need to work with large files and your process is io-bound, use ftp to retrieve and stage the data to a local disk; if you need to work with small files and your process is cpu-bound, use NFS.

Conditions for Transparent MSS Access from VMS

Recommended conditions that maximize transparency between MSS and VMS

- **Need user account on both sstcx1(UNIX) and nisdp0 (VMS)**
  - **username should match in both environements (e.g. my username is krone on nisdp0 and sstcx1)**
- **Need to validate trusted machines with an *.rhosts* file in home directory on both sstcx1 and nisdp0**
  - **Examples:**

On nisdp0:

```
$type .rhosts
essdp1.lanl.gov
nisdp0.lanl.gov
sstcx1.lanl.gov
```

On sstcx1:

```
sst10a:3%cat .rhosts
sst10c
sst10a
sst10b
sstcx1
nisdp0
benz.mit.edu
```

MSS Looks Like Local Disk on OpenVMS, but....

- The MSS is NFS mounted on NISDP0 (i.e. it looks like a local disk).
- Its device name is TEMPEST.
- Accessing files is tranparent, provided that the file you are accessing is already cached.
- If the accessed file is not cached (i.e. still on tape, but not on disk), some commands will fail.
- Accessing a file automatically triggers a retrieve, so if you wait long enough and try your command again, things will usually work.
  - Example:

```
NISDP0$set def tempest:[krone.alexis]
NISDP0$sea c93-10-05.tgz "dummy string xxx"
%SEARCH-W-READERR, error reading SSTCX1$TEMPEST:[KRONE.ALEXIS]
C93-10-05.TGZ;1
-RMS-F-RER, file read error
-SYSTEM-F-UNREACHABLE, remote node is not currently reachable
%SEARCH-I-NULLFILE, file SSTCX1$TEMPEST:[KRONE.ALEXIS]
C93-10-05.TGZ;1 contains no records
%SEARCH-I-NOMATCHES, no strings matched
NISDP0$sea c93-10-05.tgz "dummy string xxx"
%SEARCH-I-NOMATCHES, no strings matched
NISDP0$
```

- Things would be a lot nicer if we could “pre-fetch” the files we needed.

Running MSS Commands from OpenVMS (rsh)

- **rsh (stands for remote shell)**
- **syntax: rsh host command (where command is the command on the remote machine)**

Examples:

```
NISDP0$rsh sstcx1 “ls -F /tempest/krone/alexis/c93-10-0*”
/tempest/krone/alexis/c93-10-04.tgz!
/tempest/krone/alexis/c93-10-05.tgz
/tempest/krone/alexis/c93-10-06.tgz!
/tempest/krone/alexis/c93-10-07.tgz!
/tempest/krone/alexis/c93-10-08.tgz!
/tempest/krone/alexis/c93-10-09.tgz!
NISDP0$rsh sstcx1 ls -l /tempest/krone/alexis/c93-10-0*
mrw-r--r--  1 krone    10682874 Mar 17  1995 /tempest/krone/alexis/c93-10-04.tgz
-rw-r--r--  1 krone      863345 Mar 17  1995 /tempest/krone/alexis/c93-10-05.tgz
mrw-r--r--  1 krone     1307617 Mar 17  1995 /tempest/krone/alexis/c93-10-06.tgz
mrw-r--r--  1 krone     1764297 Mar 17  1995 /tempest/krone/alexis/c93-10-07.tgz
mrw-r--r--  1 krone    17543266 Mar 17  1995 /tempest/krone/alexis/c93-10-08.tgz
mrw-r--r--  1 krone    17843169 Mar 17  1995 /tempest/krone/alexis/c93-10-09.tgz
NISDP0$
```

- **m - migrated (i.e. on tape but not on disk)**
- **! - means the same thing**

Two MSS Commands Worth Knowing (fsretrieve)

- **fsretrieve - used to prefetch (i.e. make sure the file is cached to disk)**

  Examples:

```
NISDP0$rsh sstcx1 fsretrieve /tempest/krone/alexis/c93-10-0*
FS0005 30 857623 fsretrieve interim: No retrieve needed, the data is already pre
sent on the disk for file /tempest/krone/alexis/c93-10-05.tgz.
FS0589 30 857623 fsretrieve interim: FileServ software request received.
FS0347 30 857623 fsretrieve interim: File /tempest/krone/alexis/c93-10-04.tgz ha
s been retrieved.
FS0347 30 857623 fsretrieve interim: File /tempest/krone/alexis/c93-10-06.tgz ha
s been retrieved.
FS0347 30 857623 fsretrieve interim: File /tempest/krone/alexis/c93-10-07.tgz ha
s been retrieved.
FS0347 30 857623 fsretrieve interim: File /tempest/krone/alexis/c93-10-08.tgz ha
s been retrieved.
FS0347 30 857623 fsretrieve interim: File /tempest/krone/alexis/c93-10-09.tgz ha
s been retrieved.
FS0390 30 857623 fsretrieve completed: 5 out of 6 statuses were successful.

NISDP0$rsh sstcx1 “ls -F /tempest/krone/alexis/c93-10-0*”
/tempest/krone/alexis/c93-10-04.tgz
/tempest/krone/alexis/c93-10-05.tgz
/tempest/krone/alexis/c93-10-06.tgz
/tempest/krone/alexis/c93-10-07.tgz
/tempest/krone/alexis/c93-10-08.tgz
/tempest/krone/alexis/c93-10-09.tgz
NISDP0$
```

fsrmdiskcopy

- **fsrmdiskcopy - used to delete files from the disk cache if a copy is on tape**
  - **files will autmatically be flushed from the disk cache (eventually) without using this command, but...**
  - **You can be a good citizen by helping out with fsrmdiskcopy.**

Examples:

```
NISDP0$rsh sstcx1 fsrmdiskcopy /tempest/krone/alexis/c93-10-0*
FS0266 01 871385 fsrmdiskcopy interim: Data disk blocks for file /tempest/krone/
alexis/c93-10-04.tgz were successfully removed.
FS0266 01 871385 fsrmdiskcopy interim: Data disk blocks for file /tempest/krone/
alexis/c93-10-05.tgz were successfully removed.
FS0266 01 871385 fsrmdiskcopy interim: Data disk blocks for file /tempest/krone/
alexis/c93-10-06.tgz were successfully removed.
FS0266 01 871385 fsrmdiskcopy interim: Data disk blocks for file /tempest/krone/
alexis/c93-10-07.tgz were successfully removed.
FS0266 01 871385 fsrmdiskcopy interim: Data disk blocks for file /tempest/krone/
alexis/c93-10-08.tgz were successfully removed.
FS0266 01 871385 fsrmdiskcopy interim: Data disk blocks for file /tempest/krone/
alexis/c93-10-09.tgz were successfully removed.
FS0390 01 871385 fsrmdiskcopy completed: 6 out of 6 disk copy removes were succe
ssful.
NISDP0$
```

Preserving OpenVMS File Attributes

The OpenVMS file system has the notion of file attributes; UNIX does not. Two companion utilities are available which can help preserve file attributes, and also allow files to be used on non VMS systems.

zip is a utility that will preserve VMS file attributes and compress files.

- **Source code is available, public domain, free**
- **Runs on VMS, UNIX, Macintosh, PCs**
- **Allows more efficient NFS access to individual files in a .zip file on MSS**

Examples:

```
NISDP0$zip "-1Vrm" com_files.zip *.com
  adding: a.com (deflated 6%)
  adding: b.com (deflated 6%)
  adding: c.com (deflated 6%)
  adding: d.com (deflated 6%)
```

- **-1 means compress faster**
- **-V means preserve VMS file attributes**
- **-r means recurse down directories**
- **-m means delete the file after it is in the zip file**

Zip Help

Typing zip at the command line with no aguments gives help:

```
NISDP0$zip
Copyright (C) 1990-1993 Mark Adler, Richard B. Wales, Jean-loup Gailly
and Igor Mandrichenko. Type 'zip "-L"' for software license.

Zip 2.0 (Sept 7th 1993). Usage:
zip [-options] [-b path] [-t mmddyy] [-n suffixes] [zipfile list] [-xi list]
  The default action is to add or replace zipfile entries from list, which
  can include the special name - to compress standard input.
  If zipfile and list are omitted, zip compresses stdin to stdout.
  -f   freshen: only changed files  -u   update: only changed or new files
  -d   delete entries in zipfile    -m   move into zipfile (delete files)
  -k   simulate PKZIP made zipfile  -g   allow growing existing zipfile
  -r   recurse into directories     -j   junk (don't record) directory names
  -0   store only                   -l   convert LF to CR LF (-ll CR LF to LF)
  -1   compress faster              -9   compress better
  -q   quiet operation              -v   verbose operation
  -c   add one-line comments        -z   add zipfile comment
  -b   use "path" for temp file     -t   only do files after "mmddyy"
  -@   read names from stdin        -o   make zipfile as old as latest entry
  -x   exclude the following names  -i   include only the following names
 "-F"  fix zipfile(-FF try harder) "-D"  do not add directory entries
 "-T"  test zipfile integrity      "-L"  show software license
  -w   append the VMS version number to the name stored in the zip file
 "-V"  save VMS file attributes
  -h   show this help               -n   don't compress these suffixes
NISDP0$
```

Getting Files Out of A Zip Archive

unzip is a utility that extracts and decompresses files in .zip archives

- **Source code is available, public domain, free**
- **Runs on VMS, UNIX, Macintosh, PCs**
- **Allows more efficient NFS access to individual files in a .zip file on MSS**
- **Will preserve the VMS attributes if the file was 'zipped' with the attributes**

Examples:

```
NISDP0$unzip -l com_files.zip
 Length    Date    Time    Name ("^" ==> case
 ------    ----    ----    ----   conversion)
    108  11-01-95  15:48   a.com
    108  11-01-95  15:48   b.com
    108  11-01-95  15:48   c.com
    108  11-01-95  15:48   d.com
 ------                    -------
    432                    4-1 means compress faster
NISDP0$unzip com_files c*
  Inflating: c.com
NISDP0$unzip -o com_files.zip
  Inflating: a.com
  Inflating: b.com
  Inflating: c.com
  Inflating: d.com
```

- **-l means list, -o means overwrite existing files**

Unzip Help

typing unzip at the command line with no aguments gives help:

```
NISDP0$unzip
UnZip 5.0p1 of 12 January 1993, by Info-ZIP.  Portions (c) 1989 by S. H. Smith.
Bug reports ONLY to zip-bugs%wkuvx1.bitnet@ukcc.uky.edu; see README for details

Usage: unzip [ -options[modifiers] ] file[.zip] [filespec...]
  -x  extract files (default)                -l  list files (short format)
  -c  extract files to stdout/screen (CRT)   -v  list files (verbose format)
  -f  freshen existing files, create none    -p  extract to pipe, no messages
  -u  update files, create if necessary      -t  test archive integrity
                                             -z  display archive comment
modifiers:
  -n  never overwrite existing files         -X  restore owner/protection info
  -o  overwrite files WITHOUT prompting      -a  convert text (CR LF => LF)
  -j  junk paths (don't make directories)    -U  don't make names lowercase
  -q  quiet mode (-qq => quieter)            -V  retain VMS version numbers

Examples: (See manual for more information)
  unzip data1 ReadMe   => extracts file ReadMe from zipfile data1.zip
  unzip -p foo | more  => send contents of foo.zip via pipe into program more
  unzip -fo foo        => quietly replace existing files if archive files newer
  unzip "-V" foo "Bar" => must quote uppercase options and filenames in VMS
NISDP0$
```

Status of RV20 Optical Platter Migration

Migration of RV20 data

- **Started moving the first of 377 platters at the end of July**
- **Currently 264 platters have been moved including all of the RADEC data.**
- **113 platters left**
- **Target completion date is December 18th**

What does the migrated data look like?

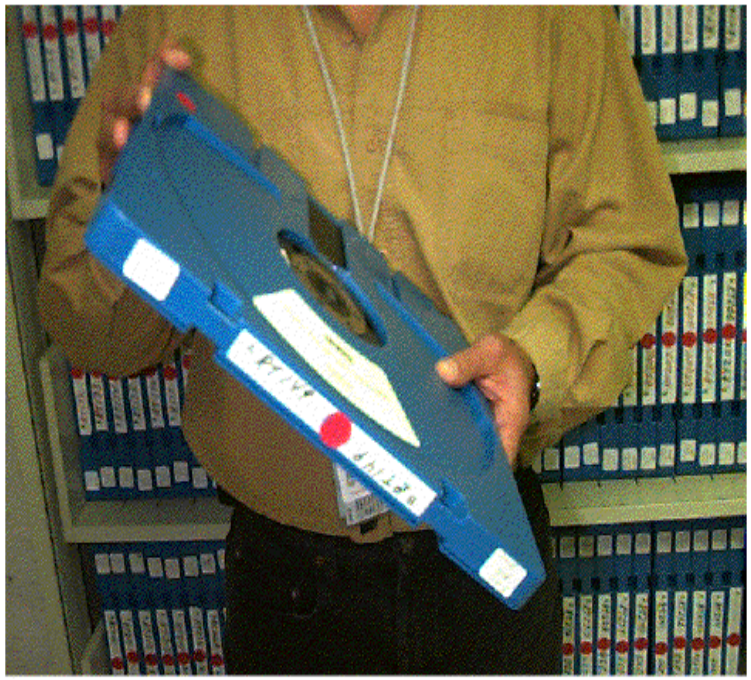
- **Data stored in TEMPEST:[rv20_platters] (VMS), /tempest/rv20_platters (UNIX)**
- **One entire side of platter is 'zipped' up and moved, and then the other.**
- **If a platter's label is RT149 then the resultant zip files are rt149a.zip and rt149b.zip and is stored as /tempest/rv20_platters/rt149a.zip and /tempest/rv20_platters/rt149b.zip**

ESSDP1 will be shutdown forever

- **ESSDP1 will be shutdown as soon as all of the optical platters have been migrated.**
- **General user access will be discontinued after December 4, 1995.**
- **We hope to shut ESSDP1 down forever in time for Christmas.**

What Does the RV20 Migration Look Like

Each migrated platter is marked with a red sticker and write protected once it is migrated. If a platter has been migrated, PLEASE don't write to that platter.



Putting It All Together

Our very contrived mission is to determine how many "version 2" files get stored on a typical RADEC platter that hasn't been cached on disk. Then we are to extract xo event records from that platter.

- **First we pick a platter at random that isn't already cached.**

```
NISDP0$rsh sstcx1 "ls -lF /tempest/rv20_platters/rt24*"
mrw-r--r--  1 krone    327789175 Aug  2 22:38 /tempest/rv20_platters/rt240a.zip!
mrw-r--r--  1 krone    350290485 Aug  4 05:10 /tempest/rv20_platters/rt240b.zip!
-rw-r--r--  1 donald   327138182 Sep  6 23:41 /tempest/rv20_platters/rt241a.zip
mrw-r--r--  1 krone    338432934 Jul 28 00:43 /tempest/rv20_platters/rt241b.zip!
mrw-r--r--  1 krone    328196189 Jul 28 19:35 /tempest/rv20_platters/rt242a.zip!
mrw-r--r--  1 krone    345094005 Jul 31 18:40 /tempest/rv20_platters/rt242b.zip!
mrw-r--r--  1 krone    343819031 Aug  2 01:12 /tempest/rv20_platters/rt243a.zip!
mrw-r--r--  1 krone    406094711 Aug  2 00:49 /tempest/rv20_platters/rt243b.zip!
mrw-r--r--  1 krone    361324580 Aug  2 22:50 /tempest/rv20_platters/rt244a.zip!
mrw-r--r--  1 krone    397948975 Aug  4 05:45 /tempest/rv20_platters/rt244b.zip!
mrw-r--r--  1 krone    344246758 Aug  2 22:43 /tempest/rv20_platters/rt245a.zip!
mrw-r--r--  1 krone    342966836 Aug  4 05:00 /tempest/rv20_platters/rt245b.zip!
```

- **We decide to pick the B side of rt240 for pre fetching.**

```
NISDP0$rsh sstcx1 fsretrieve /tempest/rv20_platters/rt240b.zip
FS0589 01 871407 fsretrieve interim: FileServ software request received.
FS0347 01 871407 fsretrieve interim: File /tempest/rv20_platters/rt240b.zip has
been retrieved.
FS0390 01 871407 fsretrieve completed: 1 out of 1 statuses were successful.
```

- **Now check for “version 2” files.**

```
NISDP0$unzip -l tempest:[rv20_platters]rt240b.zip *.*;2
 Length    Date    Time    Name ("^" ==> case
 ------    ----    ----    ----   conversion)
  58280  12-26-94  00:00   1991-080_25-dec-1994.mpa_e3u;2
   4488  01-10-95  00:00   1994-084_24-dec-1994.psa_lk1;2
  23808  01-10-95  00:00   1994-084_24-dec-1994.psa_lk2;2
    924  12-27-94  00:00   rtdl1_26-dec-1994.recalled;2
    792  12-27-94  00:00   rtdl4_26-dec-1994.recalled;2
 ------                     -------
  88292                     5
NISDP0$unzip -l tempest:[rv20_platters]rt240b.zip 1991-080_25-dec-1994.mpa_e3u;1

 Length    Date    Time    Name ("^" ==> case
 ------    ----    ----    ----   conversion)
  58280  12-26-94  00:00   1991-080_25-dec-1994.mpa_e3u;1
 ------                     -------
  58280                     1
```

- **Now extract xo event records onto a local disk (not the MSS)!**

```
NISDP0$show def
  NISDP0$DISK0:[KRONE.DEMO]
NISDP0$unzip tempest:[rv20_platters]rt240b.zip *.xo*
  Inflating: rii_2124_23-dec-1994.xo__evt
  Inflating: rii_2124_24-dec-1994.xo__evt
  Inflating: rii_2124_25-dec-1994.xo__evt
  Inflating: rii_2124_26-dec-1994.xo__evt
  Inflating: rii_2124_27-dec-1994.xo__evt
  Inflating: rii_2124_28-dec-1994.xo__evt
  Inflating: rii_2124_29-dec-1994.xo__evt
  Inflating: rii_3160_23-dec-1994.xo__evt
  Inflating: rii_3160_24-dec-1994.xo__evt
  Inflating: rii_3160_25-dec-1994.xo__evt
```

```
  Inflating: rii_3160_26-dec-1994.xo__evt
  Inflating: rii_3160_27-dec-1994.xo__evt
  Inflating: rii_3160_28-dec-1994.xo__evt
  Inflating: rii_3160_29-dec-1994.xo__evt
NISDP0$dir/full rii_2124_23-dec-1994.xo__evt

Directory DKA0:[KRONE.DEMO]

RII_2124_23-DEC-1994.XO__EVT;1            File ID:  (3298,15,2)
Size:            3/51         Owner:    [NIS_03,KRONEHEAD]
Created:   25-DEC-1994 00:00:00.00
Revised:    2-AUG-1995 09:45:15.00 (1)
Expires:   22-APR-2001 17:19:30.92
Backup:    <No backup recorded>
Effective: <None specified>
Recording: <None specified>
File organization:  Sequential
Shelved state:      Online
File attributes:    Allocation: 51, Extend: 0, Global buffer count: 0
                    No version limit
Record format:      Fixed length 164 byte records
Record attributes:  None
RMS attributes:     None
Journaling enabled: None
File protection:    System:RWED, Owner:RWED, Group:RW, World:
Access Cntrl List:  None

Total of 1 file, 3/51 blocks.
```